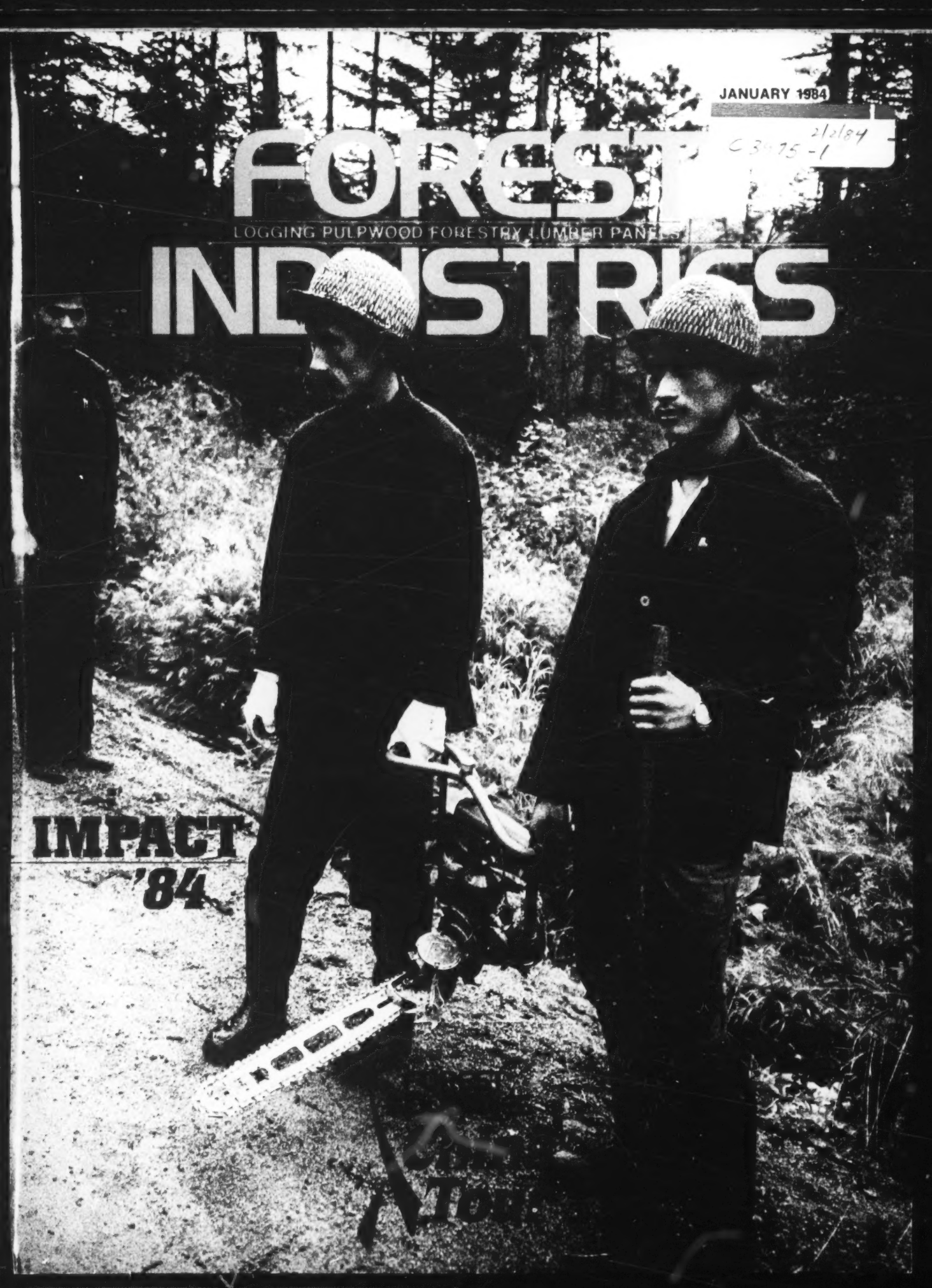
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The nearly 50,000 landowners in the American Tree Farm System are helping to meet the nation's increasing demands for wood and paper products

American Tree Farm System continues to flourish

Washington, D.C.

The American Tree Farm System, launched in 1941, is a nationwide program designed to encourage private landowners to manage their lands to produce continuous crops of trees. The program operates through 45 state Tree Farm committees under the guidance of the American Forest Institute. About 10,000 professional foresters—from industry, government and consulting firms—volunteer time to the program.

There are nearly 50,000 landowners in the system, with total acreage adding up to nearly 88 million acres.

Two grades of Tree Farmers exist in the system: "Certified" Tree Farmers are landowners who have carried out effective forestry work on a significant portion of their land; and "Pioneer" Tree Farmers are landowners who have demonstrated an interest in and commitment to forest management and a written plan, but they are still in the early stages of applying the recommendations.

Nationally, the Tree Farm System has been growing in number of tree farms at approximately 7% annually since 1981, with acreage increases of approximately 2% annually.

The South has the biggest Tree Farm program, with more than 27,000 tree farmers and 50 million acres in the system.

As could be expected with a system this big, percentage growth has slowed down in the South. The fastest growing regions are now the Mid-Atlantic Region, which is adding tree farms at 14% a year, and the New England Region, growing at close to 10% a year.

There are 1522 industrial tree farms, holding a total of more than 65 million acres. About 94% of all land owned by the forest industry is in the Tree Farm System.

Most of the rest of the system is comprised of the approximately 45,000 individuals who hold a total of 10 million acres in the "5000 acres or less" category—with an average woodlot size of 228 acres.

Tree Farm Reinspections, 1975-1983*

Year	Reinspections Needed	Reinspections Completed	Percentage
1975	6333	4402	70%
1976	6499	4016	62%
1977	6735	5935	88%
1978	7751	6714	87%
1979	7342	6253	85%
1980	7782	7166	92%
1981	8277	6663	81%
1982	8942	8184	92%
1983	9600	—	—

* *The goal is to reinspect each Tree Farm every five years to update information.*

Analysis of the types of foresters doing Tree Farm inspections shows that industrial foresters have been increasing their involvement, but state foresters still conduct most of the inspections. In 1974, industry foresters were responsible for 28% of the inspections, and state foresters did 53%. At the end of 1982, the figures were 35% and 48%, respectively.

In the "all other" category (which includes association, consulting, extension, Soil Conservation Service, and U.S. Forest Service foresters), consulting foresters are increasing their involvement. The "all other" category dropped from 19% in 1974 to 12% in 1982.

To keep the Tree Farm System credible and up to date, the American Forest Institute has a goal of reinspecting each Tree Farm every five years.

This allows information to be updated, maintains contact with landowners and ensures that the system's statistics are accurate.

Records show that the number of "needed reinspections accomplished" has risen from 70% in 1975 to [illegible] in 1982. As the system has grown, the amount of reinspection work needed also has grown; 6333 reinspections were needed in 1975, and 9600 were needed in 1983.

The American Forest Institute added the Pioneer category to the Tree Farm System in 1979 to involve landowners who have good intentions, but who have not yet accomplished the necessary forest management on their land.

Pioneer Tree Farmers are given five years in which to accomplish the foresters' recommendations to qualify for certified Tree Farm status. Certification may take place sooner if the work is completed earlier.

Tree Farm Committees keep in touch with Pioneer Tree Farmers through the American Tree Farmer magazine and State Tree Farm newsletters.

The Pioneer Tree Farm category has grown rapidly. At the end of 1979, the national total showed 133 Pioneers with 44,000 acres. At the end of 1982, there were 1200 Pioneer Tree Farms with 163,000 acres, an annual growth of more than 40% in numbers and 35% in acreage.

The Pioneer Tree Farmers are well spread over the regions of the U.S. with the Mid-Atlantic, New England, North Central and South all having similar numbers.

At the present rate of growth there should be more than 50,000 Tree Farmers managing close to 87 million acres of land next year, and another 10 years will bring the system to 100,000 Tree Farmers and close to 100 million acres. ■

—By Lester A. DeCoster

THE AUTHOR is vice president, Resources Division, American Forest Institute, Washington, D.C.

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New OSB plant uses low-grade hardwoods

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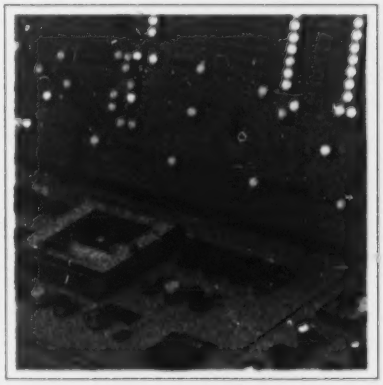

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Housing recovery, greater than anticipated, reflected in improved 1983 performance by domestic panel makers. On the horizon: a leap in waferboard and OSB capacity

Structural panels, MDF set production records

By David A. Pease

Atlanta, Georgia

It came as no surprise when U.S. panel production figures were totaled for 1983 that substantial gains were registered in all major categories, but the degree of improvement was generally greater than expected at the year's onset.

New volume records were established for structural panels and medium density fiberboard (MDF), underlining other evidence that the 12-month period indeed produced recovery from the catastrophic housing and wood products recession which preceded it.

Totals are contained in the table below. Percentage gains are:

- Structural panels, 27%.
- Particleboard, 22%.
- Medium density fiberboard, 36%.
- Hardboard, 31%.

Hardwood plywood production totals for the previous year are routinely unavailable at this time so the table runs a year behind.

The housing turnaround, stimulated by a descent of mortgage interest rates into the affordable range, was of course the greatest stimulus to increased panel output, although producers have continued their successful efforts to diversify markets.

Housing starts in 1983 reached 1.7 million units, a 60% improvement over 1982. For 1984, the National Assn. of Home Builders forecasts 1.8 million units and the American Plywood Assn. foresees 1.75 million.

Structural panels soar

For structural panels, however, recovery is built on a different foundation than existed in earlier good times. The old record for softwood plywood/structural panels was 19.9 billion ft² (⅜-in. basis) in 1978. Last year, softwood plywood alone accounted for about 19.6 billion ft² of a 20.8 billion ft² structural panel total, the balance representing the growing contribution of waferboard and oriented strand board (OSB).

Bronson J. Lewis, American Plywood Assn. executive vice president, elaborated: "Our 1978 record was predominantly influenced by the greatest-ever U.S. housing performance, 2.3 million units, which consumed 9.6 billion ft² or 48% of the 1978 industry total. This past year, starts were relatively healthy, but down almost 19% from 1978."

Last year's 1.7 million units consumed 8.35 billion ft² of structural panel products, indicating a healthy increase in the average volume per housing unit. Improved penetration of nonhousing markets was another major factor in the different end use mix, Lewis pointed out.

Nonhousing markets are currently accounting for about 60% of structural panel demand.

Last year was a better year for the structural panel industry than was forecast 12 months ago. Then, APA was looking for a 1983 total of 18 billion ft², based on an expectation of 1.3 million housing starts.

APA economists are bravely predicting another record this year of 22 billion ft², up 5.7% from 1983, with incremental gains in all major end-use categories: homebuilding, distribution (including home repair and remodeling), industrial, nonresidential construction and exports. A downturn of 3.6% is seen in 1985, however, when decreased consumption in homebuilding is expected to depress structural panel production to 21.2 billion ft², still marginally better than 1983. The association's housing forecast for 1985 is 1.62 million units. The slide will be caused by higher interest rates, resulting from a heavier federal government demand on the money supply, which will again begin to disqualify buyers at the low end of the market.

"Should positive Administration steps be taken during 1984 to reduce expenses and balance the budget, the

TABLE 1—U.S. Panel Production, 1973-1983
(thousand ft²)

Year	Structural panels (⅜-in. basis)	Particleboard (¾-in. basis)	Hardboard (⅛-in. basis)	MDF (¾-in. basis)	Hardwood plywood (surface measure)
1973	18,304,599	3,493,648	6,475,387	—	2,048,362
1974	15,878,380	3,103,800	6,056,542	—	1,644,043
1975	16,050,180	2,538,934	6,237,906	215,496	1,279,592
1976	18,440,000	3,202,225	7,066,022	280,036	1,463,135
1977	19,376,000	3,592,910	7,200,000	441,354	1,478,000
1978	19,964,000	3,720,369	7,800,000	508,416	1,480,571
1979	19,653,000	3,376,488	7,687,798	506,728	1,434,521
1980	16,468,000	2,949,897	6,140,000	493,140	1,312,000
1981	17,023,000	2,869,352	6,104,000	516,102	1,270,220
1982	16,402,554	2,393,066	5,586,918	446,157	1,123,337
1983	20,821,342	2,919,544	7,302,702	605,098	Not reported

housing decline need not occur," pointed out Robert G. Anderson, APA director of market research and economic services, in the recently issued *Economics Report E36*, an annual update that details structural panel markets.

Export shipments of 600 million ft² last year represented a modest 2.9% of the total, but growth expectations are high. APA in 1983 added a technical specialist in London and transferred other staff to new locations in Antwerp, Belgium, and Hamburg, West Germany. Export shipments should increase to 750 million ft² in 1975 (about 80% of which will go to Europe) and continue growing to 900 million ft² five years from now.

"The engine driving APA promotion in all markets is the integration of technical and market research with all other elements of the team, including quality assurance, field promotion and national advertising and publicity," Lewis remarked. "Encouraged by the panel industry's strong revival in 1983, we're building our promotional momentum with the objective of adding over 5.6 billion ft² of new demand to the total structural panel market by 1988." That would raise production above 26 billion ft².

Depending on whose ox is being gored, that margin is seen as being accounted for (a) partially, (b) wholly or (c) all and then some by the massive increase in waferboard and OSB capacity that is occurring on this continent. Improved manufacturing technology and market acceptance have advanced these products from a novel means of utilizing low-grade hardwood to a major factor in the structural panel market.

Some forecasters see this as a threat to softwood plywood products. APA's position diplomatically presumes that plywood, while not in line for any dramatic growth, will remain largely undisturbed and the new panels will satisfy the margin of consumption increase predicted.

Assuredly, a change in plywood product mix and distribution patterns will occur. (Elaboration on this point, and a review of emerging technology which will help keep softwood plywood manufacturing a viable institution, is provided on following pages by Champion International's Dick Baldwin. Also following: an overview of the reconstituted wood panel industry by Bill Pennington, Simons-Eastern's wood products manager.)

It is estimated that over 2 billion ft² of waferboard and OSB capacity may be added to the industry within the next two years, with major multiple-plant programs undertaken by Louisiana-Pacific Corp. and Georgia-Pacific Corp.

Canadian panel production jumps in '83

VANCOUVER, B.C —Last year's economy must have brought brighter moods to a lot of people in Canada's panel industry. After the poor showing 1982's depressed markets caused, last year brought a substantial rebound.

The highest growth rate, however, a 75% increase in waferboard production, is not a "fair" statistic. New mills came on line during 1983, boosting Canada's capacity significantly.

Still, the figures look great: from total production of 492,447 m³ in 1982, waferboard output leaped to 863,442 m³. According to Statistics Canada, the waferboard figures include oriented strand board. (One cubic meter equals 35.3 cubic feet.)

Softwood plywood remains the dominant panel produced in Canada, and that industry recorded a healthy 23% growth. Production rose from 1.9 billion ft² (⅜-in. basis) in 1982 to 2.33 billion ft² last year.

British Columbia's Council of Forest Industries noted that 1.99 billion ft² was produced in B.C. last year. This is 85% of the national plywood production.

Slightly over 1 billion ft² was made of Douglas fir, almost all of this in coastal B.C. According to COFI, coastal B.C.'s plywood industry continues in a slump because both labor and log costs are so high the industry is facing severe competition from other regions.

The second category, called Canadian Softwood Plywood, or CSP, consists mainly of spruce and pine. Canadian plants turned out 1.3 billion ft² of CSP in 1983.

Particleboard production in Canada increased 28% in 1983 to 717,478 m³ from 561,873 m³ in 1982. Statistics Canada reported that hardboard mills made 577.8 million ft² (⅛-in. basis) in 1983; 1982 output was not available. ■

G-P last year announced plans to build 10 OSB plants, starting with an expansion at Dudley, N.C. Others specified so far are 120 million ft²/yr facilities at Emporia, Va., and Grenada, Miss., for which ground was broken in January 1984. OSB startups in 1983 included Potlatch Corp., Cook, Minn. (its second), 155 million ft²/yr, and Martco Partnership, LeMoyen, La. (see story, pp. 20-23), 120 million ft²/yr.

L-P leads the waferboard sweepstakes with plans for six new plants, which will bring its total to 10. Spring 1984 completion dates have been placed against projects at Chilco, Idaho, 75 million ft²/yr, and Urania, La., 120 million ft²/yr (converted from particleboard). Others to come: Grenada, Miss.; Kremmling, Colo.; Oletha, Colo.; and Two Harbors, Minn. Fiber orientation machinery is being supplied to plants under construction.

Other panels show gains

Table figures (opposite) for 1983 show production increases over 1982 of 36% for MDF, 31% for hardboard and 22% for particleboard. This was the first time MDF output topped 600 million ft² (¾-in. basis), against a previous record of 530 million ft² in 1981. Capacity increases, less dramatic than waferboard and OSB, are under way in these categories as well.

In medium density fiberboard, L-P has a 50 million ft²/hr plant in Michigan's Upper Peninsula on the charts for completion in spring 1985; Montaña de Fibra has begun production at its plant in Las Vegas, N.M.; Willamette Industries Inc. has converted from particleboard at Malvern, Ark.; and Masonite Corp. is converting some hardboard capacity at Towanda, Pa., to MDF.

Contributing to additional particleboard capacity are an addition at Ponderosa Products Inc., Albuquerque, N.M., and a plant that is under construction by Les Panneaux de la Vallée, Sayabec, Que.

Hardwood plywood gearing up

Hardwood plywood manufacturers have adequate domestic and imported supplies of prefinished, printed, vinyl laminated and paper overlaid panels to take care of the interior wall surface needs indicated by NAHB and Manufactured Housing Institute estimates for 1984, declared R. L. "Dick" Crutchfield, Hardwood Plywood Manufacturers Assn. board chairman.

There are 56 prefinishers of hardwood plywood in the U.S. and six in Canada, he said. Prefinished plywood shipments peaked in 1972 at nearly 6 billion ft² (surface measure); that figure dropped to 1.6 billion ft² in the depression year of 1982.

About 75% of the substrate is lauan from Southeast Asia, with Indonesia displacing Korea as the main supplier in the past few years.

HPMA members also produce laminated flooring, cut-to-size pieces, stock panels and veneer, those interests reflected in the association's divisions. HPMA also provides independent laboratory testing services. ■

The reconstituted board industry is undergoing rapid change. Demographics and raw material costs will make the Southeast U.S. a particularly strong growth area

Market expansion forecast for reconstituted boards

By William H. Pennington

Atlanta, Georgia

A reconstituted board is a wood product that has been manufactured by reducing solid wood to a smaller component—particle, fiber, strand, flake, wafer, etc.—and then gluing the small components back together into a usable board product.

The reconstituted board industry is generally divided into two major classifications: structural and industrial. Industrial panels include particleboard, hardboard and medium density fiberboard. Variations of these basic products exist under other names such as flakeboard, thinboard, etc.

Structural panels include waferboard, oriented strand board and composite plywood, or com-ply. Generally, these products compete with plywood for their place in the market.

Some history

Hardboard was the first of the family of reconstituted board plants to become a major market factor. The growth of the hardboard market peaked around 1965 and the last plants were built around 1970.

This wet-process board had lost much of its appeal in new construction primarily because of three factors: 1) development of thin dry-board products; 2) environmental problems associated with a wet process; and 3) the increase in energy costs required to dry the product had become prohibitive.

Particleboard was the first of the dry reconstituted board products to be introduced. The development of particleboard began in earnest in Europe after World War II, but at least two plants were built in the U.S. in the mid-1930s. The massive expansion of the particleboard industry in the United States did not begin until the early 1960s. Production was less than 500 million ft² in 1960, ¾-in. basis. This increased to over 3.5 billion ft² in 1972-73 before the last major slump in the industry. Particleboard production capability remains at about that level today. The majority of particleboard consumption remains in industrial uses, particularly the furniture industry, and in underlayment in new residential housing.

Waferboard, as defined by the Canadian Standards Assn., is a mat-formed panel product using wood particles having a length of at least 30 mm (1.2 in.) along the grain direction and a predetermined thickness. The wafer is essentially flat and has the grain of the wood in the plane of the wafer. The wafers resemble small pieces of veneer. Typically, wafers are from 1½ to 3 in. square and .025 to .035 in. thick.

Waferboard was developed by Dr. James Clark in 1957 in Sand Point, Idaho. The product was primarily a ¾-in.-thick panel used as a low-cost sheathing panel. Since that time, up until the recent past, the product has been essentially a Canadian product.

The history of waferboard capacity is shown in Table 1.

In 1981, approximately 50% of Canadian production was exported to the U.S. Operating efficiency in Canada was 70%. In the U.S., installed waferboard capacity is approximately 3% of installed capacity of softwood plywood. For North America, waferboard capacity is just under 10% of softwood plywood capacity.

Oriented strand board is a composite reconstituted board that attempts to capture portions of the market currently held by plywood and waferboard by duplicating the physical properties of plywood.

A patent was issued in 1961 to Armin Elmendorf for oriented strand board (issued in the U.S. in 1965). The new product did not develop until the most recent past, however, due partly to the low cost of plywood and technical difficulties, especially in properly orienting the strands.

The first pilot plant was built by Potlatch, followed by a commercial plant. The product was used almost exclusively to produce core panels for com-ply. The second OSB plant, constructed by Georgia-Pacific in Dudley, N.C., was also used primarily for the manufacture of core for composite plywood. In 1981-82, three OSB plants were opened in the U.S. Total U.S. production today is more than 500 million ft², ⅜-in. basis.

Com-ply is a structural panel that is a combination of a reconstituted board core with a veneer cover top and bottom. Original tests beginning in the early '50s with com-ply used particleboard as the core. In today's context, however, com-ply is assumed to mean an oriented strand core with the orientation at right angles to the veneer. Generally, the veneer is oriented in the 8-ft direction of a typical 4 ft x 8 ft panel. Com-ply has equivalent physical properties as plywood made with the same veneers. A one-lathe, 100 million ft² (⅜-in. basis) plywood plant can produce as much as 180 million ft² of com-ply with the same volume of raw material. The actual increase in volume will depend on the size and quality of logs used.

Medium density fiberboard (MDF) is produced by a process that ties together the technologies of hardboard and particleboard. The furniture market created by particleboard led to the opportunity for MDF. Furniture manufacturers required a panel with an edge that could be finished cheaply. They also needed a board without the problems associated with screw holding in both faces of particleboard. MDF solved both problems with a product that could be produced without the expense of plywood or solid wood.

The first MDF plant in the U.S. was a Pope & Talbot particleboard plant that used non-pressurized refiners and produced a 60 lb/ft³ panel. The screw-holding ability, and the ease with which edges could be routed and finished, made the board readily accepted by furniture manufacturers.

The advent of pressurized refiners has permitted a reduction in panel density to 45 lb/ft³ and less while retaining advantages in screw holding and finishing over traditional particleboard.

Structural panel end uses

Residential construction has provided roughly half of the market for structural panels, plywood and reconstituted panels.

Other end uses are, in descending order: residential remodeling and repair, non-residential construction, the materials handling industry (including pallets and containers), and exports.

Thus far in this article, three structural panels have been introduced that have the potential for competing in many areas with plywood. Which of the three—waferboard, OSB or com-ply—will be the trend setter?

Pros and cons of com-ply

The first most obvious advantage of com-ply is that it looks, feels, smells and performs like plywood, a product that is universally accepted in the market place. Second, raw materials cost can be reduced significantly. This is especially true in view of the rapidly decreasing availability of large-diameter peeler blocks. The yield on a 24-in. average block is 60%. This drops to approximately 45% on a 10-in. average block. A recent plywood project that our firm worked on is sorting blocks of 7½ in. and larger to the plywood plant. Obviously, the yield from this size block is quite small.

The disadvantages of com-ply are equally obvious. Production of com-ply requires the use of two different technologies, plywood and reconstituted board, to produce one product. Capital costs and operating costs of such an operation tend to be greater, therefore, than the costs of a single product plant.

Feasibility studies conducted in recent years have indicated that the development of a com-ply plant can be justified under certain economic conditions. An example would be where a cross-oriented core-board plant is added to an existing, fully depreciated plywood plant which is experiencing high costs and insufficient availability of peeler quality logs.

Waferboard vs. OSB

Since waferboard was the first of the two new structural panels, it has developed some significant advantages. The major advantages are:

- It has known market acceptance.
- Its technology is proven.
- Product quality is proven.
- The cost of manufacturing is reasonably well established.

The major disadvantages of waferboard are:

- There are shortcomings in bending and stiffness properties and long-term durability.
- It is limited to certain wood species. (Nearly all waferboard is produced from aspen.)
- Properties are limited by requirement for powdered resin.
- There are difficulties in producing and conveying wafer shape.

It may, of course, be possible to eliminate all of the disadvantages of waferboard by continuing research. These changes, however, will negate the major advantages of proven technology, quality and cost. Market acceptance conceivably could be affected as well.

The first disadvantage of OSB is the risk associated with technical and marketing aspects of introducing a new product. Technical risks are primarily concentrated in three areas: strand preparation, blending and orientation equipment. All of these areas are being worked on by equipment suppliers, research agencies and board producers. It is not likely that a perfect solution will ever be attained. However, it can be demonstrated that a superior board (compared with waferboard) can be produced without achieving perfect strands, blending or orientation.

A second major disadvantage is board appearance and market acceptance—OSB can look like inferior particleboard. This could prove to be a major detriment in attempting to develop the market. This is especially true in the do-it-yourself market that has been developed by waferboard.

Another possible disadvantage could be a potential increase in manufacturing cost due to increased resin cost. This can be disputed, however, since there are reasons to believe that the reverse may be true.

There are several potential advantages to OSB. The most obvious, and perhaps the most important, advantage of OSB is that there are increased physical properties. This is a distinct advantage in structural applications that are in direct competition with plywood. It is also true that it is possible to better control the strength properties of OSB. The possibility exists to "engineer" a board to meet differing requirements by varying resin content, strand size, density, orientation, etc.

Among the other possible advantages of OSB are:

- The ability to use liquid resins, while waferboard is currently limited to powdered resins.
- OSB can be produced using low-grade wood forms such as maxi-chips. This conceivably could eliminate on-site woodyards.
- OSB has a wider tolerance for moisture variations.
- High-density wood species can be turned into a good structural product at board densities of 45 lb/ft^3 and less.

TABLE 1—Waferboard capacity

Year	Capacity U.S.	Capacity Canada
1957	25	—
1961	25	40
1969	25	190
1972	105	190
1975	105	590
1979	90	800
1980	90	1050
1981	550	1275

NOTE: Capacity is on ⅜-in. basis in millions of ft^2 per year.

- Conveying, storing, blending and forming of strands should be easier than for wafers.

Much of the technology developed for waferboard is transferrable to OSB. A considerable amount of experimentation is on-going to resolve the other problems. It appears the new structural panel, especially for the Southeast, is most likely to be OSB.

Two remaining questions that must be addressed are the costs of producing reconstituted boards and the market potential.

There are two principal cost factors: the capital costs required and approximate operating costs. Following is a series of "order of magnitude" estimates for the different boards.

Capital costs

Costs are based on a summary of various studies and actual plant costs. The following assumptions were used to develop cost estimates:

- Plants will be located in the southeastern U.S.
- Estimates are based on January 1984 dollars.
- Estimates are "order of magnitude" only and cannot be used for any specific project.
- Estimated site preparation costs are to cover a green field project and would include clearing, removal of overburden, site drainage, access roads, paving and rail spur.
- Estimated building costs include building foundations, floor slab and buildings.
- Estimated machinery costs include production equipment, electrical distribution, compressed air, heat generation and all services.
- Estimated installation costs include all charges for labor, tool rentals, temporary equipment and contractor overhead.
- Project management and engineering fees are a target estimate and include construction budget preparation, conceptual engineering, detailed engi-

neering, equipment specification, issuing tender documents, bid comparisons, expediting, site coordination, start-up assistance, and budget control.

• Contingency funds are estimated as 10% of the installed costs.

The estimated capital costs shown below are based on a plywood plant with an annual capacity of 100 million ft², ⅜-in. basis.

Site preparation	$2,500,000
Buildings	3,900,000
Machinery	15,000,000
Installation	2,500,000
	$23,000,000
Project management	1,700,000
Contingency	2,300,000
	$27,000,000

This estimate is based on a single lathe and the associated matching equipment. All plant areas are assumed to operate at two shifts per day and 250 days per year except for the dryers, which operate three shifts per day. The capacity chosen was because this is the nominal production of a one-lathe plant.

The production of the plant could be increased by operating more shifts on all equipment except the dryers. To achieve greater production, additional funds must be included for drying equipment.

The estimated capital costs shown below are based on a waferboard plant with an annual production capacity of 226 million ft², ⅜-in. basis.

Site preparation	$2,500,000
Buildings	4,500,000
Machinery	20,000,000
Installation	6,000,000
	$33,000,000
Project management	2,500,000
Contingency	3,400,000
	$39,000,000

This estimate is based on three shifts per day, 320 days per year. The basic equipment selected was three waferizers, two ring debarkers, two dryers, four blenders and a multi-opening press. The press is a 14-opening, 8x24-ft press.

The plant size and equipment selected is economically feasible in many manufacturing and market areas. It is likely, however, that a smaller size plant might be more feasible. Since each item of the basic equipment has more than one unit, it is practical to scale the plant down to a smaller size. The cost savings are, of course, not linear, but capital costs savings could be realized in most plant areas.

The estimated capital costs shown below are based on an oriented strand board plant with an annual production capacity of 226 million ft², ⅜-in. basis.

Site preparation	$2,500,000
Buildings	4,500,000
Machinery	21,000,000
Installation	6,000,000
	$34,000,000
Project management	2,600,000
Contingency	3,400,000
	$40,000,000

This estimate is also based on a three-shift, 320-day schedule. The equipment is virtually the same size as that for waferboard, so again it would be possible to reduce the size of the plant and reduce capital costs.

There is considerably less experience with installation of OSB plants, so more caution should be exercised in using these numbers.

Operating costs

Operating costs of southern plywood plants can vary substantially depending primarily on the cost of the raw material. The wood cost is typically 60% of the total panel cost, and most projections indicate that this percentage could be as high as 70% of the total in the near future.

Wood cost in a waferboard or OSB plant, on the other hand, can be 25 to 30% or less of the total panel cost.

The cost of resin and wax is obviously higher in reconstituted panels. The net difference in operating cost in a plywood plant can be as much as 30% in favor of the newer panels.

Historical operating costs of waferboard plants in the Southeast are limited at best, and operating cost data for OSB plants are virtually non-existent. It is generally assumed that operating costs for the two products will be virtually the same. If mixed southern hardwoods can be successfully used in the manufacture of OSB, the scale will likely be tipped in favor of OSB.

For all practical purposes, then, it may be said that capital and operating costs for a new waferboard or OSB plant using today's technology will be roughly the same. Both are very competitive in terms of cost when compared with new plywood plants.

The final area to be addressed is the near-term market potential for reconstituted board products.

Factors that will affect the market for structural panels, especially for the next 10 years, are demographics, interest rates, housing starts, size and type of housing, shifting of the wood products industry to the South, availability of raw material, non-residential uses, and other factors.

These variables will be briefly addressed before a forecast is attemped.

The emphasis here will be on the southeastern U.S.

Demographics

The largest population increases in the U.S. for the next 10 years is expected to be in the age group from 25 to 44. In fact, the National Assn. of Home Builders has projected that in the age group 25 to 34, there will be an additional 700,000 per year increase for the next 10 years. This is the age group that is most likely to purchase new homes.

There is also a well-documented shift in the U.S. population to the Sun Belt. By all projections, this should have created a tremendous boom in the housing market in the Southeast beginning in 1980.

However, over the last couple of years, demographics have not been the driving force; the unparalleled high interest rates have quenched the demand for housing to record lows. This in turn has led to a substantially increased demand for structural panels for remodeling and repair.

Interest rates

It is fair to say that no one projected that interest rates would increase to the levels that they did during 1980 and 1981.

Many experts did project that interest rates would increase and that the increase would affect the housing industry, of course, but none of the experts projected the depression that occurred.

What about interest rates over the next 10-year period? The most general consensus is that mortgage interest rates will remain at roughly 12 to 13% for the foreseeable future.

If interest rates remain on this level, housing will still increase at a relatively good pace because of the demand for new housing. For this analysis, it is assumed that housing starts will be at 1,750,000 in 1984, with a gradual increase to 1,930,000 in 1990.

Size and type of housing

In the late '70s, over 70% of all new housing was in single-family units. This decreased in 1981 to about 64%. Most people would agree that the pressures of higher interest rates and escalating housing costs will continue to drive the percentage of single-family units downward. We also have seen a reduction of the average size of the single family unit. From a peak in 1979-80, the average size has decreased by approximately 2%. Many have projected that this slide will continue and the total reduction could be 4% by 1990. Of course, many are also projecting that the typical American home of the future will be as small as 1000 to 1100 ft². While this is possible, it seems unlikely that such a dramatic change would occur in the foreseeable future.

Shifting to the South

In 1965, approximately 3% of softwood plywood was produced in the South. By 1980, this percentage had increased to about 45% of the total plywood produced. This was just slightly lower than the 45.5% produced in the Oregon/Washington area. The remaining 9.5% balance included panels produced in the California and Rocky Mountain region, and the new structural panels.

The major problem facing plywood manufacturers in the Northwest is the accelerating depletion of the raw material, Douglas fir. The U.S. Forest Service estimates that companies are harvesting at a rate 2.5 times the forest growth. The Forest Service forecasts that the timber harvest from industry acreage will decline approximately 32% between 1976 and 1990, and another 20% drop is projected by the year 2000.

The amount of timber acreage sold by the Forest Service rose by only 10% between 1973 and 1980. Because of this supply and demand imbalance, bid prices at Forest Service auctions have advanced dramatically so that the cost of raw material in the West Coast area has more than doubled the cost in the South.

In addition to the cheaper timber, southern plywood manufacturers have access to cheaper labor and enjoy a closer freight haul to the growing Sunbelt area and to the mature but still substantial markets in the Midwest and the East. The 11 western states accounted for 26% of the housing starts in 1979 but produced 58% of the total plywood production.

It seems almost inevitable that a greater regionalization of the panel market will occur, causing a further erosion in demand for western plywood.

Availability of raw material

The availability of hardwoods as well as softwoods in the Southeast is ideal for increased production of structural panels. Hardwoods comprise more than half of the inventory of timber in the South, and about three-quarters of this inventory is in private ownership and thus immune to Forest Service actions. Although hardwoods comprise over half of the inventory, only 29% of the total output of timber in the South is hardwood. The growth-to-removal ratio for softwood in the South is 1.4, and for hardwood it is 2.3.

It is anticipated there will be increasing price demands on softwood for use in pulp and paper. This will, of course, also pressure the cost of plywood peeler blocks upward. The abundance of under-utilized hardwood is an ideal raw material for the new structural panels.

TABLE 2—Structural panels market projections*

	1984	1985	1986	1987	1988	1989	1990
HOUSING STARTS (thousands)	1750	1750	1785	1820	1850	1890	1930
Residential construction							
Single-family	4980	5040	5100	5150	5220	5280	5340
Multi-family	2390	2445	2500	2555	2610	2665	2720
Mobile homes	230	235	240	245	250	255	260
Total	7600	7720	7840	7960	8080	8200	8320
Remodeling	7400	7640	7880	8120	8360	8600	8840
Nonresidential construction	3080	3180	3280	3380	3480	3580	3680
Industrial	2920	3010	3100	3190	3280	3370	3460
Consumption	**21,000**	**21,550**	**22,100**	**22,650**	**23,200**	**23,750**	**24,300**
Exports	750	800	850	900	950	1000	1050
Imports	210	220	230	240	250	260	270
Production	**21,540**	**22,130**	**22,720**	**23,310**	**23,900**	**24,490**	**25,080**

* Panel consumption and production projections are given in millions of ft²

Non-residential uses

New housing construction is expected to take around one-third of the total structural panel supply. Remodeling and repair of existing structures has the same size market. This market is expected to grow at a rate of 6% per year. The other markets, principally non-residential construction, industrial, and exports, are also anticipated to grow over the next 10-year period, but not nearly as dramatically as that which should be experienced in residential housing and remolding and repair of existing structures. It is expected there will be an approximately 3% annual increase in the use of structural panels for non-residential construction, 3% annual increase for industrial uses and a net 5% increase in exports. In 1979, the net exports of plywood were 402 million ft². The American Plywood Assn. projects that by 1985, the net exports could reach 750 million ft².

Market projection

Given the preceding if's, maybe's and assumptions, certain facts can be established regarding the market potential for structural panels. Table 2 shows projections for the total structural panel market through 1990.

Potential markets such as all-wood foundations have not been factored into these projections.

At first glance, it might appear that there is only a slight demand increase for structural panels through 1984. In 1979, the capacity for plywood and, therefore, essentially for structural panels, was 22.5 billion ft², ⅜-in basis. The increase in new plywood and structural panel plants, as well as modernization of existing plants, has increased this total to about 24 billion ft².

There are two factors that negate this apparent abundance of structural panel capacity. The first is that almost 2.0 billion ft² of West Coast capacity has been permanently closed in the last two years. An additional 2.0 billion (and perhaps as much as 3.0 billion) ft² of West Coast capacity is expected to close in the immediate future. These closings are primarily the result of the shifting market, not the current economy. At least an additional 0.5 billion ft² of capacity has been permanently closed in the South.

This brings the net capacity down to approximately 19.5 billion ft². As noted earlier, plywood production has rarely exceeded 90% of reported capacity. Assuming that this 90% figure is maintained, the net production reduces to 17.5 billion ft².

This means that the structural panel industry will be in a squeeze for product as early as 1984-85. Certainly some of the increased production can come from modernizing existing plywood plants. More capacity will also come from structural panel plants that are already in the planning stage and from Canadian imports. Some of the "permanently closed" facilities, especially in the South, would possibly re-open if demand developed fast enough. The remainder must come from new plants.

Will this new production capability be plywood or reconstituted panel? This author projects that plywood will remain the dominent force in structural panels, but – due to reduced capital and operating costs – most, if not all, expansion in structural panels will come from reconstituted panels, particularly OSB.

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